

## **2014 Maryland FMP Report (July 2015)**

### **Section 24. Largemouth Bass (*Micropterus salmoides*) in Maryland Tidewater**

Stock assessments for largemouth bass in tidal freshwater rivers of Chesapeake Bay watershed are performed each year and were completed for 2014. In general, the status of most tributary populations was unchanged or exhibited improvements from previous assessments. For the heavily fished Potomac River population, however, the current status warranted additional investigation that was performed throughout 2013 and 2014. Statewide regulations are currently being reviewed and additional ones are being considered. In 2015, greater restrictions on handling fish were imposed on tournament anglers via the permit issued to tournament directors. These restrictions included directors ensuring that bags containing black bass did not leak and had water in them when transporting fish. Three large fishing areas within Potomac River and three areas in the upper Chesapeake Bay are being considered as tidal, catch-and-return areas.

Stock assessments and management actions are described in the Fishery Management Plan (FMP) for Largemouth Bass in Maryland Tidewater (January 2014). The goal of the FMP is to describe objective reference points and provide management targets for populations in tidal freshwater habitats of the Maryland portion of the Chesapeake Bay watershed. When necessary, management actions are recommended to improve population structure and ultimately achieve reference points. The plan was developed in concordance with the Standard Operating Procedure (SOP) for the Tidal Bass Program (TBP) survey of largemouth bass. The methodology within the SOP has undergone external peer-review for at least 3 cases and results are reported annually within the Federal Aid Report (for federal and technical audiences) and Black Bass Annual Review (for general public). The annual reviews are reports posted on the TBP website:

<http://dnr2.maryland.gov/fisheries/Pages/bass/index.aspx>.

Largemouth bass have been widely introduced throughout the United States from beyond their initial Mississippi River drainage distribution. As populations thrived, commercial and recreational fisheries developed. Commercial sale of largemouth bass is not legal in Maryland and the recreational fishery includes pass-time fishing, live-release competitive sportfishing, and charter boat guiding. Adults are typically caught and released by anglers throughout the year. Year-class strength may depend on the number of offspring produced during spring, their survivorship throughout summer, and their survivorship during winter. In Maryland, the number of juveniles collected during fall is usually a good indicator of year-class strength. The oldest documented largemouth bass in Maryland tidal water of the Chesapeake Bay watershed was 13 years old; however, largemouth bass are known to reach 22 years so older individuals in the watershed are likely to exist.

## **Stock Status**

The largemouth bass stocks within tidal rivers of the Maryland portion of the Chesapeake Bay watershed were assessed in 2014 and the assessment was internally peer-reviewed in Spring 2015. The review team concluded that the Potomac River stock had undergone greater than average levels of annual mortality in 2008 and 2009, but that those levels are currently normal or below average. In addition, habitat loss has greatly affected the Potomac River and upper Chesapeake Bay stocks. Habitats have been steadily, but slowly improving since 2011 when tropical storms created conditions that lessened the distribution of submerged aquatic vegetation (SAV). Since habitat loss has affected populations within the Potomac River and upper Chesapeake Bay watershed, there are two actions that the TBP is taking. First, as noted in the FMP, the TBP is continuing to monitor changes in the distribution of SAV and continuing to identify important habitats for promoting population growth of these stocks. Second, the TBP may propose both educational outreach and regulation changes to help minimize fishing mortality and restrict movement of fish from important habitats that promote population growth of stocks

The stocks in both the Potomac River and upper Chesapeake Bay demonstrated improved reproduction over previous years. Indices for distribution of juveniles are above the average management targets for the stock; those for catch, however, remain below average. Stocks in other tidal rivers have also demonstrated improved reproduction and catches of adults are mostly unchanged. Stocks from the Patuxent River, Marshyhope Creek, Wicomico River, and Pocomoke River are less fished than the upper Chesapeake Bay and Potomac River. While they each represent unique demographics that are reflective of unique habitats, recent annual differences in catch, age structure and stock size have been minimal. Thus, management targets for these stocks are within acceptable reference points noted in the FMP.

## **Current Management Measures/The Fishery**

The reported number of largemouth bass caught, weighed, and released by anglers during sport fish tournaments was 19,678. Currently, there are no protocols in place to measure the number of largemouth bass caught and released by pass-time anglers or charter boat guide clients. A creel survey is being developed to measure fishing effort statewide. Once that survey is developed, fishing effort and total catch will be reportable for stocks in specific Maryland tidal rivers of the Chesapeake Bay watershed.

There is a minimum size limit of 12-inches for largemouth bass between June 15 and March 1 in tidewater. This minimum size limit essentially prevents smaller or younger fish from being harvested (~ 1 % of anglers) or being moved around and experiencing handling stress during competitive sportfishing tournaments. There currently are no reliable statistics that indicate the proportion of

tournament anglers within the bass fishery. Nonetheless, tournament anglers are considered a large, important group of anglers within the fishery. There is a 15-inch minimum size limit for largemouth bass between March 1 and June 15 (inclusive) in tidewater. The larger size limit was implemented in 1989 to reduce the number of sexually mature largemouth bass moved from their nest to a weighing station during the spawning season. These size limits do not prevent catch-and-release fishing which can be harmful during the spawning season and can also lead to mortality from excessive handling. There is no reliable estimate of catch-and-release mortality for any tidewater largemouth bass fishery in Maryland.

### **Biological Reference Points**

Reference points in the 2014 Tidal Bass FMP were updated to improve management of targeted fisheries (see Table 1).

In addition, an index and reference points to reflect changes in age 1+ largemouth bass were included for targeted rivers.

### **Focus Areas 2015-16**

The TBP will focus on the following actions:

- 1) Continue Tidal Bass Survey so that at least a 10-year baseline of data is established for targeted tidewater areas populations and populations are monitored at least bi-annually. Continue surveys as specified in the Tidal Bass Program's Standard Operating Procedure (<http://dnr2.maryland.gov/fisheries/Pages/bass/reports.aspx>) during fall as funded with federal and state money.
- 2) Determine catch-and-release mortality for pass-time fishing using both long-term mark-recapture studies (at least 3 years) and short-term, hatchery pond experiments at Manning Hatchery using federal money.
- 3) Determine the appropriate management units of populations using genetic markers, particularly in the upper Chesapeake Bay. The genetic relationship among individuals collected from several streams in the upper Chesapeake Bay should be determined in the next 10 years by identifying a lab capable of performing the work and requesting appropriate funding.
- 4) Develop measures to determine angler satisfaction and relate those measures to fishery-independent and fishery-dependent indices. Angler satisfaction will be determined using statewide creel surveys and angler preference surveys conducted annually or semi-annually. These surveys are on-line surveys. Rewards are provided to a randomly selected subset of participants twice a year.

- 5) Determine economic impact of the fishery using statewide angler creel surveys and determining the economic impact of tournaments.
- 6) Develop a forage fish index by increasing the quality of data collected on forage fish during the tidal bass survey, which is done by optimizing survey methods, and calculating a forage fish index in 2015 with existing data.

**Fishery Management Plan for Largemouth Bass in Maryland Tidewater Implementation Table (updated 6/15)**

Strategy	Actions	Dates	Comments
1.1 Annually conduct tidal bass surveys on targeted rivers, critically evaluate indices that are used to determine changes in the abundance, health, and life history of largemouth bass within tidewater areas of the Chesapeake Bay watershed, and develop new indices as necessary	1.1.1 Coordinate with regional managers to survey tidewater areas and collect data needed to develop indices	Sep - Oct 2014	Survey completed for 2014 (see Table 2 and Table 3 for survey results).
	1.1.2 Share results with anglers, stakeholders, and the general public via a Federal Aid Report, one-page summary sheets, and annual information booklet, and other forms as requested	Jan - Feb 2015	Black Bass Annual Review completed, placed online( <a href="http://dnr2.maryland.gov/fisheries/Pages/bass/reports.aspx">http://dnr2.maryland.gov/fisheries/Pages/bass/reports.aspx</a> ) and disseminated among anglers and tournament directors. Federal Aid Report completed, but not provided on-line.
	1.1.3 Discuss indices with members of partner agencies, organizations, and universities to evaluate causes or consequences of changes in the indices	Feb 2015	Action taken during the black bass roundtable included partner agencies and stakeholders. Voluntary restrictions in creel limit have been adopted by some tournament organizations. Catch-and-return areas will be proposed in 2015 to help maintain spawning stock in productive bass areas.

	1.1.4 Develop new indices, such as angler satisfaction indices, or adjust existing indices as needed	Jun 2015	Indices adjusted to reflect new baseline dataset for Potomac River and for Patuxent River.
	1.1.5 Improve sharing of data with other Department biologists and programs, such as the Blue Infrastructure Initiative and GIFS	Mar - Jun 2015	Reviewed and critiqued aspects of GIFS that will improve use of the system.
1.2 Annually assess data quality and effective usefulness of data collection	1.2.1 Conduct general assessments of variance within catch and other indices and ensure variance is considerably lower than the average point estimate		No work was done on this action between June 2014 and June 2015.
	1.2.2 Discuss the scope of data collection with regional managers and directors within Inland Fisheries so that data collection is determined to be sufficient for meeting the demands of the Department	Aug 2014	The first caucus of regional biologists was held to discuss problems with the Tidal Bass Survey and identify resolutions. Data collection was improved to objectively and consistently account for the occurrence of species other than largemouth bass.

	1.2.3 Allow internal and external peer-review of data collection and analysis to refine methods based on expert opinions	Aug 2014 - Jun 2015	Two publications were externally reviewed, critiqued by experts, and ultimately accepted for publication; each publication contained information on Tidal Bass Survey collection methods and analysis of catch data. Survey methods are adequate for meeting objectives of this Fishery Management Plan.
	1.2.4 Deliver technical reports to regional managers, other internal reviewers, and reviewers of refereed journals for review of methods and data analysis		No work was done on this action between June 2014 and June 2015.
	1.2.5 Assess and/or improve sampling equipment for efficiency	Jun - Aug 2014; November - December 2014	During summer, work was performed to check the effectiveness of electrodes aboard the southern region electrofishing boat; During November/December, QA/QC checks performed on dataset after data were entered into the Inland Fisheries database, GIFS. Datasheets were edited and updates to GIFS were suggested to improve data entry from data sheets.
2.1 Establish biological reference points for populations of tidewater largemouth bass and use them to assess population status	2.1.1 Compute 25th and 75th percentiles for each index from the reference dataset, which will be annual averages computed across a minimum of 10 years of data	Jun 2014 - Jun 2015	Reference points were re-evaluated and readjusted in the 2014 Tidal Bass FMP; reference points were used to assess population status in winter 2014 (see Table 1).

	2.1.2 Obtain additional data for populations surveyed less than 10 years and develop reference points	Sep - Oct 2014	Data were collected from Patuxent River to complete a base-line, 10 year dataset
	2.1.3 Use reference points from the peer reviewed literature, when possible, as comparisons to reference points, particularly for populations that do not have a reference dataset of at least 10 years	Dec 2014	Reference points from the literature (see Table 1) were used to evaluate populations from rivers that do not have a reference dataset of at least 10 years; these evaluations were provided in the 2015 Federal Aid Report.
	2.1.4 Adjust reference points as additional data are acquired for inter-correlations and importance in reflecting the status of populations		No work was done on this action between June 2014 and June 2015.



2.2 Compare current indices to the reference points and assess significant differences between current indices and historical reference points	2.2.1 Evaluate indices relative to all available reference points and historical data to determine which reference points describe a problem with the fishery	Nov-Dec 2014	Indices were compared to assess significant differences between current indices and historical reference points
	2.2.2 Develop a management strategy for imperiled populations by constructing a framework of management actions for improving indices	Nov 2014 - Jun 2015	Management actions were evaluated to help improve the fishery of Potomac River and protect fishery of the upper Chesapeake Bay. In addition to public scoping and meetings with other jurisdictions, spatial modeling was conducted to determine the influence of catch-and-return areas. Additional strategies such as targeting black bass anglers with conservation materials and developing reef habitat in the Potomac River are also on-going.
	2.2.3 Conduct population modeling to determine if and how management actions will influence indices and the population	Dec 2014 - Jan 2015	Spatial modeling was conducted to determine how catch-and-return areas would influence populations of largemouth bass in the Potomac River and upper Chesapeake Bay

2.3 Establish reference points for angler exploitation of largemouth bass populations in tidewater	2.3.1 Coordinate with directors of competitive events to obtain information on catch and initial mortality of Largemouth Bass	Jun 2014 - Jun 2015	Most directors of tournaments are routinely required to provide catch data and data on initial mortality of largemouth bass via an on-line reporting system, as required by the permit they receive for staging a tournament.
	2.3.2 Promote registration and activity reporting of tournament directors, for communication and compliance of permit restrictions	Mar 2015	A letter was issued to past and current tournament directors that reminded them of the obligation to get a free permit and the requirements of the permit itself (i.e., reporting requirements, no leaking bags).
	2.3.3 Report results during an annual or semi-annual bass roundtable meeting that includes participants from tournaments and the recreational angling community	Feb 2015	A stakeholder roundtable meeting was held at the Chesapeake Bay Foundation. The agenda and minutes from the meeting are provided on-line at, <a href="http://dnr2.maryland.gov/fisheries/Pages/bass/reports.aspx">http://dnr2.maryland.gov/fisheries/Pages/bass/reports.aspx</a> .

	2.3.4 Perform angler creel surveys, as necessary, to determine angler satisfaction, catch, and harvest rates by recreational anglers	Jan - May 2015	A statewide creel survey was developed and issued to provide angler exploitation indices; additional datasets were evaluated for their utility (Chesapeake Catch, Angler's Log, MRFS); angler exploitation indices and reference points have not yet been fully developed.
	2.3.5 Produce studies and provide guidance on live well operating procedures to reduce mortality of Largemouth Bass	Nov 2014	Reviewed and updated guidelines on live release and handling tips in the Maryland Fishing Guide 2015.

3.1 Identify valuable habitat and habitat conditions for largemouth bass and promote their protection	3.1.1 Refine the habitat suitability index using important habitat variables for identifying and prioritizing suitable habitat for Largemouth Bass		No work was done on this action between June 2014 and June 2015.
	3.1.2 Ensure that the most informative variables are being measured during the Tidal Bass Survey by conferring with MD NDR Fisheries Habitat and Ecosystem Program		No work was done on this action between June 2014 and June 2015.

	3.1.3 Use a habitat suitability index and consult anglers and regional managers to identify habitats important for the spawning success and growth of Largemouth Bass	Jun 2014 - Jun 2015	Suitability of spawning coves were identified for several tidal rivers; an ArcGIS shapefile was created to illustrate the coves; the work was written up and will be published in fall 2015 by American Midland Naturalist. It conveys how coves were ranked according to their ability to support largemouth bass reproduction. A spatial map illustrating these coves is available via the Tidal Bass Program website.
	3.1.4 Consult published literature and experts to help identify valuable habitat for spawning success and growth of Largemouth Bass	Jun 2014 - Jun 2015	Published literature on spawning habitat for largemouth bass was summarized in an upcoming publication in fall 2015 in American Midland Naturalist.
	3.1.5 Generate and submit to GreenPrint spatial data reflecting valuable habitats for Largemouth Bass and anglers		No work was done on this action between June 2014 and June 2015.

	3.1.6 Consider the effects of climate change on Largemouth Bass habitat and develop adaptive management to address possible changes	Jun 2014 - Jun 2015	The impacts of sea level rise on nursery habitats of largemouth bass was investigated and will be published in American Midland Naturalist in fall 2015. While some nursery habitats in Potomac River and the upper Chesapeake Bay will be negatively affected by sea level rise, the fisheries may be robust to changes because the species is likely to expand its range as water temperatures warm.
	3.1.7 Utilize the proposed Climate Sensitive Areas for use in land-use planning and increased protection of vulnerable habitats especially in regards to Largemouth Bass habitat		No work was done on this action between June 2014 and June 2015.
	3.1.8 Provide comments during permit review via MD DNR Environmental Review to help minimize ecological impacts on populations from tidewater of the Chesapeake Bay watershed and Largemouth Bass habitat		No work was done on this action between June 2014 and June 2015.

	3.1.9 Write letters on official letterhead to stakeholders or on behalf of stakeholders to acknowledge and promote the significance of the fishery		No work was done on this action between June 2014 and June 2015.
	3.1.10 Promote a level of imperviousness that is lower than 10% of the drainage		No work was done on this action between June 2014 and June 2015.
	3.1.11 Ensure that natural variability in stream discharge is maintained by encouraging "smart growth" and limiting channelization		No work was done on this action between June 2014 and June 2015.
	3.1.12 Encourage lower levels of nitrogen and phosphorus waste from entering waterways via non-point and point sources	Apr - Jun 2015	Electronic communication with Chesapeake Bay Trust, Wicomico River Trust, and Salisbury University was prompted to encourage greater mitigation of nitrogen and phosphorus pollution into the upper Wicomico River. A Wicomico Creek-watchers report was issued in June and provided a progress report. Both nitrogen and phosphorus have declined in abundance and their source is tied to stormwater rather than the wastewater treatment plant. The City of Salisbury is exerting effort to obtain money and solutions for stormwater management.

	3.1.13 Proactively work through a comprehensive plan renewal process to identify and protect important habitat features		No work was done on this action between June 2014 and June 2015.
	3.1.14 Collect data on invasive species as habitat data is collected in order to better monitor changes in habitat conditions over time and evaluate how those changes would affect the Largemouth Bass fishery	Sep - Oct 2014	Data for invasive snakeheads were collected as part of the Tidal Bass Survey; these monitoring data were presented at a USFWS interagency taskforce to discuss impacts of snakeheads. Blue and flathead catfish are also considered invasive species and monitoring will begin on the Patuxent River in 2016. The commercial harvest of blue catfish is currently monitored on the Potomac River. Impacts of blue catfish on resources used by largemouth bass are being evaluated.



<p>3.2 Improve habitat conditions for largemouth bass and species on which largemouth bass depend</p>	<p>3.2.1 Identify and determine the need for protected areas that are completely or temporarily closed to Largemouth Bass fishing either year-round or during the spawning season to prevent displacement or high levels of catch-and-release mortality</p>	<p>Jan-Mar 2014; Nov 2014</p>	<p>The addition of habitat structures to spawning coves was evaluated; however, these additions were not effective; work indicates natural habitat (such as submerged aquatic vegetation (SAV)) is important for productivity. Public awareness on the importance of SAV for productivity of largemouth bass was discussed at the Potomac River Fishery Commission's inter-agency meeting in November 2014. It was decided to continue monitoring the issue and to annually discuss changes in the fishery.</p>
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	3.2.2 Use ecosystem-based management to provide management options that protect growth or survival of Largemouth Bass and accounts for competition or predation by invasive species		No work was done on this action between June 2014 and June 2015.
	3.2.3 Tidal Bass Program staff may work with Artificial Reef Program staff (MARI) as needed to develop reefs and other artificial habitat for Largemouth Bass	Feb - Jun 2015	An artificial reef ball project is proposed, partially funded, and may be permitted for Smoots Bay (National Harbor). This project should be completed in 2016. It will compensate for grass lost from the area in the last decade.

	3.2.4 Develop innovative storm water management techniques, promote storm water management retrofits where applicable, creation of wet marshy conditions throughout watersheds, and reconnect streams to riparian areas		No work was done on this action between June 2014 and June 2015.
	3.2.5 Upgrade and improve semi-natural landscape elements, such as man-made wetlands, ponds, and recreated natural lands		No work was done on this action between June 2014 and June 2015.
	3.2.6 Promote low sedimentation of streams		No work was done on this action between June 2014 and June 2015.

4.1 Generate a decision making process to resolve identified problems with the population and fishery as they relate to significant departures of indices from reference points	4.1.1 Hold public meetings to determine angler behavior and perceptions on the quality of the fishery	Dec 2014	A public meeting was held with the Potomac River Fisheries Commission to allow the general public to voice concerns regarding the Potomac River fishery.
	4.1.2 Evaluate the adequacy of current regulations in supporting the sustainability and quality of the fishery	Jun 2014 - Jun 2015	Current regulations were evaluated by MDDNR staff to determine what changes may be made to improve the sustainability of the Potomac River and upper Chesapeake Bay fisheries. Catch-and-return areas were suggested, as well as reduced creel limits during the summer. Both of these actions, are being considered by MDDNR. A reduced creel during summer is already voluntarily implemented by some organizations. A limit on the number of tournaments is not likely because the infrastructure implement a limit does not exist for other States that share borders with Maryland waters.
	4.1.3 Establish relationships between fishery independent data, angler catch, and angler satisfaction		No work was done on this action between June 2014 and June 2015. Data regarding angler satisfaction will be collected in 2016.

4.2 Enhance fish populations by releasing hatchery raised largemouth bass, when natural reproduction or recruitment is deemed insufficient for sustaining a fishery	4.2.1 Target tidewater areas that require stocking of Largemouth Bass that are determined to be at risk and would be expected to suffer a decline in the quality of the fishery without stocking efforts	Jun - Oct 2014; Jun - Jul 2015	In June, largemouth bass were released to the Potomac River, where populations have suffered recruitment declines. In October, juveniles were released to Gunpowder River, where habitat conditions limit the reproduction of largemouth bass. Largemouth bass were stocked in Mattawoman Creek in June 2015 and in the Patuxent River in July 2015.
	4.2.2 Generate a stocking strategy with an objective to either support or improve the fishery	Jun - Oct 2014	Based on the hatchery assessment performed in summer 2014, it was determined that advanced fingerlings (6 - 10") should be released to the Gunpowder River and fingerlings (2 - 4") should be released to the Potomac River.

4.3 Promote the survival and abundance of older, larger fish	4.3.1 Adjust creel limits or size limits for promoting survival of older fish when: 1) there are few adults in the population for enabling sufficient recruitment that sustains the population; or b) catch rates for adults are too low to provide a quality fishery	Jun-Oct 2014; Dec 2014	Provided funding and in-kind support for research on keeping adult largemouth bass alive in live-wells at Mississippi State University. In December, clarified requirements on existing permits for tournament directors that will help reduce handling stress on adults. It is also being considered to target black bass anglers with current information on reducing handling stress of bass that anglers intend to keep alive. Catch-and-release areas are also being proposed to help promote the survivorship of older, larger fish.
	4.3.2 Improve and promote angler awareness that increases survivorship of Largemouth Bass during catch-and-release fishing		No work was done on this action between June 2014 and June 2015.

	4.3.3 Engage in meaningful studies that benefit the angling community by informing them on methods to improve survivorship		No work was done on this action between June 2014 and June 2015.
	4.3.4 Enforce restrictions on holding more than 5 bass/angler/day by specially permitted release boat captains	Jun - Oct 2014; Apr - Jun 2015	Tournaments with release boats were attended by staff. Oxygen and temperature conditions required in the permit were measured by MDDNR staff. When problems occurred, they were solved by the release boat crew and MDDNR staff.
	4.3.5 When necessary, discourage the transportation of Largemouth Bass among river systems or to an uninterrupted area greater than 30 km from its area of capture	Feb 2015	Transportation of largemouth bass among river systems was discouraged at the annual stakeholder meeting.

4.4 Protect, enhance and improve important angler access points to the tidewater largemouth bass fishery	4.4.1 As part of the Chesapeake Bay Watershed Access Plan, 300 public access sites will be developed in the watershed and important angler access points to the tidewater Largemouth Bass fishery should be provided	May-Jun 2014	Worked with intra-departmental personnel on an angler access map that helps direct anglers to fishing spots. Promoted the map via the Allan Ellis radio program in summer 2014.
	4.4.2 Determine crowding of angler access points and mitigate, when possible		No work was done on this action between June 2014 and June 2015.
	4.4.3 Encourage public or DNR Fisheries to identify potentially new access areas for motor boats		No work was done on this action between June 2014 and June 2015.
	4.4.4 Create and/or advertise new angler access points to the tidewater Largemouth Bass fishery		No work was done on this action between June 2014 and June 2015.



	4.4.5 Promote small craft and shore based angler access		No work was done on this action between June 2014 and June 2015.
5.1 Improve habitat for largemouth bass	5.1.1 Control and manage invasive species that threaten the health or sustainability of Largemouth Bass populations	Jun-Aug 2014	Incentive programs, such as the statewide invasive species record, were promoted to help control and manage invasive species (Northern snakehead).
	5.1.2 Monitor, protect or enhance the availability of prey for Largemouth Bass by partnering with other agencies or other programs within MD DNR	Aug 2014	A monitoring strategy was implemented within the Tidal Bass Program for documenting the availability of prey. Partnering divisions also provide data from the Maryland Biological Stream Survey and Juvenile Finfish Seine Survey. There was no work toward protecting or enhancing the availability of forage.
	5.1.3 Control or limit pollution sources to impaired waterways in order to improve the sustainability of Largemouth Bass populations	Apr - Jun 2015	Progress was made in providing outreach materials on how pollution will be limited by waste water treatment plant upgrades and stormwater management; concerned stakeholders were contacted with relevant information; collaboration with Salisbury University was established to jointly monitor water quality on the upper Wicomico River.

5.2 Maintain important aspects of ecosystem function to maintain habitat for largemouth bass	5.2.1 Identify components of ecosystem function essential for the sustainability of Largemouth Bass populations	Jun-Aug 2014	Progress was made to identify components of ecosystem function essential for sustainability of largemouth bass populations, particularly those components related to SAV.
	5.2.2 Identify possible threats to the maintenance and function essential for the sustainability of Largemouth Bass	Jun - Aug 2014	Ecosystem threats to the fishery in the Potomac River and upper Chesapeake Bay were largely identified as ones related to loss of SAV. Other threats may include a loss of forage fish, which is being evaluated in Fiscal Year 2016.
	5.2.3 Preserve ecosystem components that are essential and potentially threatened		No work was done on this action between June 2014 and June 2015.

Acronyms: GIFS = Geographic Inland Fisheries Survey System MDDNR = Maryland Department of Natural Resources QA/QC = quality assurance/quality control SAV = Submerged Aquatic Vegetation

Table 1. Reference points of biological indices of Largemouth Bass (*Micropterus salmoides*) in tidal tributaries of the Chesapeake Bay were generated from Cleveland 25th and 75th percentiles for available years (N = number of years) of survey or creel data (1999 - 2014). Abbreviations are: catch per unit effort (CPUE) for all Largemouth Bass and juveniles (Juv); proportional size distribution (PSD) for juveniles, 200-305 mm and 200-381 mm fish; proportional occurrence (OCC) of juveniles among sampled sites; relative weight (Wr); body condition (Kn); instantaneous mortality (Z); growth rates (GR) for exponential (EXP) and von Bertalanffy growth models (VBGF); slope of the length-weight regression (LW); mortality (M) for small (Sm) and large (Lg) tournaments (TX); catch per angler hour (CPAH) for tournaments; and habitat suitability index (HSI).

Fishery Independent		<i>CPUE</i>	<i>Cor-CPUE</i>	<i>CPUE, 1+</i>	<i>Juv<sub>CPUE</sub></i>	<i>Juv%OCC</i>	<i>Juv<sub>PSD</sub></i>	<i>PSD<sub>305</sub></i>	<i>PSD<sub>381</sub></i>
CHESTER (N=9)	25 <sup>th</sup>	13.796	0.985	20.318	11.914	0.123	0.065	0.635	0.293
CHESTER (N=9)	75 <sup>th</sup>	41.756	4.55	57.092	25.575	0.631	0.219	0.823	0.823
CHOPTANK (N=13)	25 <sup>th</sup>	14.232	1.079	12.510	10.481	0.279	0.149	0.630	0.295
CHOPTANK (N=13)	75 <sup>th</sup>	48.350	3.112	37.108	22.087	0.433	0.327	0.739	0.351
POTOMAC (N=15)	25 <sup>th</sup>	50.730	5.841	27.723	26.611	0.577	0.351	0.572	0.261
POTOMAC (N=15)	75 <sup>th</sup>	100.899	15.107	59.817	50.707	0.831	0.622	0.810	0.353
UPPERBAY (N=13)	25 <sup>th</sup>	63.458	5.409	31.964	22.011	0.500	0.621	0.697	0.310
UPPERBAY (N=13)	75 <sup>th</sup>	101.299	12.069	69.864	49.713	0.769	0.842	0.820	0.560
PATUXENT (N=10)	25 <sup>th</sup>	23.460	2.867	21.117	15.624	0.409	0.191	0.565	0.216
PATUXENT (N=10)	75 <sup>th</sup>	56.087	7.435	45.283	20.458	0.522	0.388	0.746	0.351
<i>Add'l Reference</i>		<i>na</i>	<i>na</i>	<i>na</i>	<i>na</i>	<i>na</i>	<i>na</i>	<i>≈ 0.572</i>	<i>≈ 0.245</i>

Fishery Independent		<i>-Z</i>	<i>GR-EXP</i>	<i>GR-VBGF</i>	<i>LW-Slope</i>	<i>W<sub>r</sub></i>	<i>K<sub>n</sub></i>
CHESTER (N=9)	25 <sup>th</sup>	0.685	60.296	60.482	3.142	0.999	0.994
CHESTER (N=9)	75 <sup>th</sup>	0.605	65.394	65.582	3.230	1.003	1.003
CHOPTANK (N=13)	25 <sup>th</sup>	0.774	64.124	64.292	3.218	0.997	0.993
CHOPTANK (N=13)	75 <sup>th</sup>	0.540	67.744	67.982	3.310	1.002	1.005
POTOMAC (N=15)	25 <sup>th</sup>	0.877	62.116	62.354	3.132	1.000	0.986
POTOMAC (N=15)	75 <sup>th</sup>	0.614	69.677	69.265	3.285	1.001	1.000
UPPERBAY (N=13)	25 <sup>th</sup>	0.767	64.083	64.336	3.168	1.002	0.990
UPPERBAY (N=13)	75 <sup>th</sup>	0.603	68.469	68.819	3.236	1.006	0.998
PATUXENT (N=10)	25 <sup>th</sup>	0.787	60.880	61.027	3.181	0.998	0.982
PATUXENT (N=10)	75 <sup>th</sup>	0.565	65.454	65.690	3.248	1.006	0.991
CHESTER (N=9)	25 <sup>th</sup>	0.685	60.296	60.482	3.142	0.999	0.994
CHESTER (N=9)	75 <sup>th</sup>	0.605	65.394	65.582	3.230	1.003	1.003
CHOPTANK (N=13)	25 <sup>th</sup>	0.774	64.124	64.292	3.218	0.997	0.993
CHOPTANK (N=13)	75 <sup>th</sup>	0.540	67.744	67.982	3.310	1.002	1.005
POTOMAC (N=15)	25 <sup>th</sup>	0.877	62.116	62.354	3.132	1.000	0.986
POTOMAC (N=15)	75 <sup>th</sup>	0.614	69.677	69.265	3.285	1.001	1.000
UPPERBAY (N=13)	25 <sup>th</sup>	0.767	64.083	3.168	3.168	1.002	0.990
UPPERBAY (N=13)	75 <sup>th</sup>	0.603	68.469	3.236	3.236	1.006	0.998
PATUXENT (N=10)	25 <sup>th</sup>	0.787	60.880	61.027	3.181	0.998	0.982
PATUXENT (N=10)	75 <sup>th</sup>	0.565	65.454	65.690	3.248	1.006	0.991
<i>Add'l Reference</i>		$\approx 0.57$	$\approx 68.44$	$\approx 68.44$	$\approx 3.00$	$\approx 1.000$	$\approx 1.000$

		Spawning Season			Non-Spawning Season		
Fishery Dependent		<i>Sm TX IM</i>	<i>Lg TX IM</i>	<i>CPAH</i>	<i>Sm TX IM</i>	<i>Lg TX IM</i>	<i>CPAH</i>
N	25 <sup>th</sup>	11	11	11	11	10	15
POTOMAC	75 <sup>th</sup>	0.011	0.013	0.211	0.014	0.013	0.250
POTOMAC	25 <sup>th</sup>	0.015	0.028	0.287	0.027	0.035	0.389
N		9	5	10	10	7	9
UPPERBAY	25 <sup>th</sup>	0.004	0.000	0.278	0.007	0.010	0.164
UPPERBAY	75 <sup>th</sup>	0.018	0.022	0.307	0.034	0.027	0.219
<i>Add'l Reference</i>		≤ 0.05	≤ 0.05	<i>na</i>	≤ 0.05	≤ 0.05	<i>na</i>

Habitat		<i>HSI</i>
N		8
ALL RIVERS	25 <sup>th</sup>	0.714
ALL RIVERS	75 <sup>th</sup>	0.817
<i>Add'l Reference</i>		<i>na</i>

Table 2. Stock assessment of largemouth bass populations in 2014 for targeted drainages of the Chesapeake Bay watershed using indices and metrics reflecting changes in population biology. When a metric falls below the 25<sup>th</sup> percentile computed for available data for that river, the ▼ symbol is given. When a metric falls above the 75<sup>th</sup> percentile computed for available data for that river, then the ▲ symbol is given. nc = value falls within the 25<sup>th</sup> and 75<sup>th</sup> percentiles. For tidal rivers where 25<sup>th</sup> and 75<sup>th</sup> percentiles for populations were not available, values were compared to general, reference point-estimates established for non-Maryland populations; ☺ = values similar to reference point-estimate and ☹ = values much different than reference point. Abbreviations for indices are in text.

River	N	CPUE	Cor-CPUE	PSD <sub>305</sub>	PSD <sub>381</sub>	-Z	GR-EXPrise	GR-VBGF	LW-Slope	W <sub>r</sub>	K <sub>n</sub>
Upper Bay	28	62.02 ▼	8.78	0.87 ▲	0.59 ▲	NA	68.49 ▲	68.73	3.15 ▼	1.01 ▼	1.00 ▲
Potomac	46	44.16 ▼	5.84 ▼	0.97 ▲	0.55 ▲	-0.57 ▼	64.63	65.05	3.12 ▼	1.01	1.00
Patuxent	28	20.11	2.97	0.49 ☹	0.35 ☺	NA	65.45	65.69	3.03	1.03	1.01
Wicomico	25	10.77	1.09	0.67 ☺	0.41 ☺	0.42 ☹	62.43	62.72	3.18	1.01	1.00
Marshyhope	25	28.25	2.97	0.79 ☺	0.19 ☹	0.87 ☺	62.60	62.87	3.07	1.00	1.00
Pocomoke	28	44.80	4.66	0.48 ☹	0.16 ☹	0.64 ☺	64.13	64.50	3.09	0.99	1.00
Gunpowder	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

<sup>1</sup>NA = Not Available; Gunpowder River were not surveyed because of malfunctioning equipment.

Table 3. Juvenile production for largemouth bass populations in 2014 for targeted drainages of the Chesapeake Bay watershed. When an index fell below the 25<sup>th</sup> percentile computed for available data for that river, the ▼ symbol is given. When a metric fell above the 75<sup>th</sup> percentile computed for available data for that river, then the ▲ symbol is given. n.c. = value falls within the 25<sup>th</sup> and 75<sup>th</sup> percentiles. Abbreviations for indices are in text. The sample size for JuvCPUE and JUV%OCC is given in parentheses as N.

River	JuvCPUE	JUVPSD	JUV%OCC (N)
Upper Bay	52.20 ▲	0.68	0.79 (19) ▲
Potomac	25.98	0.77 ▲	0.82 (34)
Patuxent	18.79	0.57	0.36 (22)
Wicomico	8.87	0.25	0.29 (17)
Marshyhope	17.39	0.47	0.41 (17)
Pocomoke	21.36	0.46	0.84 (19)
Gunpowder	NA	NA	NA